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Proceedings of the PSARC Invertebrate Subcommittee Meeting November 21, 2003

Compte rendu de la réunion du sous-comité des invertébrés du CEESP, 21 novembre 2003

November 21, 2003
Nanaimo, B.C.

J. Boutillier
Invertebrate Subcommittee Chair

Fisheries and Oceans Canada
Pacific Scientific Advice Review Committee
Pacific Biological Station
Nanaimo, British Columbia V9T 6N7

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PACIFIC SCIENTIFIC ADVICE REVIEW COMMITTEE (PSARC)
INVERTEBRATE SUBCOMMITTEE MEETING

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SUMMARY

The Pacific Scientific Advice Review Committee (PSARC) Invertebrate Subcommittee met November 21, 2003 at the Pacific Biological Station in Nanaimo, B.C. The Subcommittee reviewed one working paper.

Working Paper I2003-05: Assessment of the Dungeness Crab Population in the Nass Estuary, 2000 and 2001
R.F. Alexander, W.J. Gazey and I. Winther

This paper presented a review of a two year, in-depth study of the fisheries and the biological attributes of Dungeness crab resources within the Nass River estuary and how they affect the Nisga'a entitlement to crab resources as defined by the Nisga'a Final Agreement. The management objectives for this area are to provide commercial and recreational opportunities to fish Dungeness crabs while insuring that First Nations fishers have ready and sufficient access to the resource to meet their treaty defined needs. The study focused on results from fishery independent assessments using standard tag/recapture studies, ultra-sonic tag monitoring programs and index site assessment as well as fishery-dependent catch and effort monitoring. The objective of the paper was to evaluate the current management strategies of a closed area and a short commercial fishery against treaty-defined management objectives of ready and sufficient access.

A number of technical errors and sections in need of clarification were identified by both the reviewers and the Subcommittee. However, fortunately the authors had access to the reviews in sufficient time to incorporate corrected analyses and improved clarity into their presentations. In so doing, they were able to assure the Subcommittee that although the numbers changed, the major conclusions and recommendations resulting from these analyses could still be supported.

In discussions of the conclusions and recommendations presented in the paper, the Subcommittee felt it was necessary to caution the managers that interpretation of the results of this study should only be considered within the context of the ranges of abundance and fisheries (commercial, Nisga'a and sports) effort experienced during the two years of the study. If any of these variables change, it could have a significant effect on how successful the management options are. The Subcommittee did note the effect of poor catch monitoring on the results of this study and did concur with the recommended direction of improving catch monitoring. The Subcommittee recognized the benefits from a defined schedule of regular assessments, but noted that the assessment framework has to be developed in parallel to quantifiable management objectives. Since quantifiable management objectives have yet to be defined through the treaty process, it was felt that little direction could be given on the nature of the most appropriate assessment framework.

SOMMAIRE

Le Sous-comité des invertébrés du Comité d'examen des évaluations scientifiques du Pacifique (CEESP) s'est réuni le 21 novembre 2003 à la Station biologique du Pacifique, située à Nanaimo (C.-B.), pour examiner un document de travail.

Document de travail I2003-05 : Évaluation de la population de crabe dormeur dans l'estuaire de la rivière Nass en 2000 et en 2001

R.F. Alexander, W.J. Gazey et I. Winther

Ce document présente un examen d'une étude approfondie de deux ans sur les pêches et les caractéristiques biologiques du crabe dormeur de l'estuaire de la rivière Nass et sur leurs répercussions sur les droits d'utilisation de cette ressource que possède la Nation Nisga'a aux termes de l'Entente définitive des Nisga'as. Les objectifs de gestion pour cette zone sont d'offrir des possibilités de pêche commerciale ou récréative du crabe dormeur tout en veillant à ce que les pêcheurs autochtones ait un accès aisé et suffisant à la ressource pour satisfaire leurs besoins définis dans l'entente. L'étude portait sur les résultats d'évaluations indépendantes de la pêche fondées sur des études standard de marquage-recapture, des programmes de surveillance de marques à ultrasons et des évaluations de sites repères ainsi que sur la surveillance des prises et de l'effort de pêche. L'objectif de ce document est d'évaluer les stratégies de gestion actuelles d'une zone fermée et d'une brève pêche commerciale par rapport aux objectifs de gestion définis dans l'entente (accès aisé et suffisant).

Les examinateurs et le Sous-comité relèvent un certain nombre d'erreurs techniques à corriger et de sections à clarifier. Heureusement, les auteurs ont eu accès aux relevés d'examen assez rapidement pour intégrer les corrections et améliorer la clarté de leurs présentations. Ils ont ainsi pu assurer le Sous-comité que, malgré les chiffres différents, les principales conclusions et recommandations formulées à la suite de ces analyses pourraient encore être appuyées.

Après discussion sur les conclusions et les recommandations présentées dans ce document, le Sous-comité estime qu'il est nécessaire d'avertir les gestionnaires que les résultats de l'étude ne devraient être interprétés que dans le contexte des abondances et des efforts de pêche (commerciale, autochtone et récréative) observés durant les deux ans de l'étude. Le changement de l'une de ces variables pourrait grandement influer sur le succès des options de gestion. Le Sous-comité constate l'effet d'une mauvaise surveillance des prises sur les résultats de l'étude et appuie la recommandation visant à améliorer cette surveillance. Il reconnaît les avantages d'un calendrier précis d'évaluations régulières, mais souligne que le cadre d'évaluation doit être élaboré parallèlement à l'établissement d'objectifs de gestion quantifiables. Puisque ces objectifs restent à déterminer dans le cadre du processus de négociation avec les Nisga'as, il est jugé que peu de directives claires peuvent

être données à l'égard des caractéristiques que devrait posséder un cadre d'évaluation approprié.

INTRODUCTION

The PSARC Invertebrate Subcommittee met November 21, 2003, at the Pacific Biological Station in Nanaimo, British Columbia. External participants from industry and First Nations attended the meeting. The Subcommittee Chair, J. Boutillier, opened the meeting by welcoming the participants. During the introductory remarks the objectives of the meeting were reviewed, and the Subcommittee accepted the meeting agenda.

The Subcommittee reviewed one Working Paper which is summarized in Appendix 1. The meeting agenda appears as Appendix 2. A list of meeting participants, observers and reviewers is included as Appendix 3.

DETAILED COMMENTS FROM THE REVIEWS

I2003-05: Assessment of the Dungeness Crab Population in the Nass Estuary, 2000 and 2001

R.F. Alexander, W.J. Gazey, and I. Winther

Subcommittee Discussion

The first reviewer found difficulty in reading the report because of the excessive amount of detail in the results presented. He stressed the need for substantial revisions with a strong emphasis on efficient conveyance of the most essential results.

This reviewer expressed some reservations about the assumptions made in the mark-recapture model that was used to estimate abundance and exploitation rates. Of particular concern were assumptions regarding loss of tags, recruitment of sub-legal crabs into legal size and the absence of natural mortality over the course of the experiment. The latter concern stems from the fact that tagging took place over a long enough period of time that natural mortality occurred and needs to be accounted for in the population estimate.

Other concerns made by the first reviewer included:

- Commercial catch estimation procedures
- Presentation of recovery data in standard array format
- Clarification of number of marked crabs in various areas and whether this implies instantaneous movement/redistribution
- Was it necessary to report the results of the ultrasonic tagging in this study?

- How were the number of crabs that moulted per month calculated?
- More details of how the true tag recovery rate was estimated from monitored catch
- No justification for the conclusion regarding the "sustainability of the fishery and the status of the crab population in the Nass estuary."

The second reviewer felt there was a need to clarify a number of objectives and requested a more detailed description of the quantitative methods. He requested further details, explanations and references on the use of the log-linear model (LLM) and its applicability in this study.

This reviewer also expressed concern regarding the assumptions and computational procedures of the mark-recapture model. The use of the non-detection rate was improperly used in the model to estimate recapture rates. Clarification on the undefined terms and plots of the posterior distributions were requested.

The reviewer felt that the limitations of the annual instantaneous rate of loss of tagged legal-sized crabs need to be clearly stated.

This reviewer identified the need for clarification in the section on annual moult rates to indicate that this is not an annual rate, it is only an estimate of the recruitment rate of sub-legal to legal sized crabs over the period of the study.

Most of the Subcommittee discussion focused on changes to the paper that were required for clarification and to correct problems identified by the reviewers and the Subcommittee. The Subcommittee agreed with one of the reviewers that a more efficient presentation of the results would greatly improve the paper and make it a valuable contribution to knowledge of Dungeness crab populations and fisheries in B.C. In particular the following changes need to be made prior to acceptance of the paper.

1. Catch estimation procedures need to be clarified and if possible, estimates of uncertainty should be presented for these catch estimates.
2. Although requested by one reviewer, it was felt that the need to put recovery data in standard array format was not needed for this paper.
3. Clarification is required on the impacts of the assumption that the "population did not change over the period of the study" on the use of the priors in the Bayesian mark-recapture model.
4. The paper should only include the information required to support the conclusions and recommendations; for example the revised paper needs to clarify how the ultra-sonic tag results are used in the evaluation of the management strategies.
5. The paper should include the corrected analyses that properly reflect the use of estimates of "non-detection of a mark" and correction and clarification of Appendix F in the Working Paper with graphic presentation of posterior

distributions generated by the analyses (these were included in the presentation).

6. Discussion on the potential bias on in-season moulting estimates that may occur because only hard-shelled animals were tagged and counted.
7. Other small errors such as: C. tanneri was C. bairdi, the use of the term sub-legal vs. pre-recruit, the need to define terms like small crabs in the text and referencing these terms to the findings on moult increments, loose use of the word "area".

Subcommittee discussion then focused on the conclusions and recommendations of the report. The authors presented four conclusions in their presentation which varied from the three conclusions in the paper originally submitted. The conclusions that the authors felt should be discussed were:

1) No significant effect of commercial fishery on availability of legal-size crabs in Kincolith.
2) The current management regime of a short commercial fishery late in the year combined with the area closed to commercial fishing maintains the availability of crab for Nisga'a and sport harvest by resulting in low to moderate exploitation rates.
3) Soft-shelled periods occur typically in spring and early summer. Timing of the commercial fishery from Oct 1 – Nov 15 is good for maximizing hard-shelled catch and reducing soft-shelled injuries.
4) Population in the Nass Estuary is healthy and productive (initially stated as the "fisheries are sustainable").

Subcommittee Conclusions

The Subcommittee and the reviewers were very impressed with the study and complimented all the participants of the study on a job well done. In reviewing the findings of the study the Subcommittee:

1) Agreed with the authors that the commercial fishery did not have a significant negative effect on the Nisga'a fishery. However, they cautioned that the interpretation of these results needed the caveat "that this was true under the ranges of abundance and fisheries (commercial, Nisga'a and sports) effort experienced in the two years of the study".
2) Agreed with the authors that the current management regime maintains availability to crab for the Nisga'a by resulting in a moderate exploitation rate, but felt that the terms 'low to moderate' should be put into context. A 50-60% harvest rate on available legal crab resource in 6 weeks is moderate in comparison to many other Dungeness crab fisheries. It was recognized that this relatively low exploitation rate manifested itself in the availability of some very large crabs which would have to have moulted at least one year after the crab was legal size. The Subcommittee agreed with the finding that the management strategies employed were effective in meeting the management objectives as stated with the caveat "that this was true under the ranges of

abundance and fisheries (commercial, Nisga'a and sports) effort experienced in the two years of the study".

3) Agreed that the timing of the commercial fishery as it stands now is appropriate to satisfy the management objective of avoiding softshell crab.
4) Agreed that the population of crab in the Nass during the period of study was healthy and productive but that this conclusion needs the same abundance and effort caveat stated in conclusions 1 and 2 above. The sub-committee also agreed with the first reviewer's final review point and warned that this study could not be interpreted to imply that the present management action will ensure that the fisheries are "sustainable". It is evident that there are many changes occurring in the region including road access to the area which could and may already be changing the nature of effort and exploitation.

The paper made four recommendations:

1) Retaining the closed 0.5-mile boundary in the Kincolith stratum.
2) Retain the 6-week fall (Oct 1- Nov 15) fishery.
3) Improve catch monitoring.
4) Define a schedule of regular assessments.

The Subcommittee concluded that the first two management strategies outlined in recommendations 1 and 2 above, worked to achieve the management objectives as they were stated for the two years of the study. However, the Subcommittee felt that a recommendation of specific management strategies requires a risk assessment of different management tactics against measurable management objectives. Since this was not done in the paper, the Subcommittee could not support the recommendations per se; however, they did conclude that the management options are effective in achieving the management objectives as outlined as long as the fisheries impacts and the status of the resource remained within the range found over the period of the study. The Subcommittee did agree with the recommendation to improve catch monitoring, as this will be the main source of data from which to monitor changes in the fishery and catch rates. The Subcommittee also recognized the benefits from a defined schedule of regular assessments, but noted that the assessment framework has to be developed in parallel to quantifiable management objectives. As quantifiable management objectives have yet to be defined in the treaty process, it was felt that little direction could be given on the nature of the most appropriate assessment framework.

Subcommittee Recommendations

The paper was accepted subject to revision outlined by the reviewers and agreed upon by the Subcommittee (see discussions above for revision comments).

The Subcommittee recommended that under the present management framework for this resource, assessments should focus on improvements to the catch monitoring programs in commercial, Nisga'a, and recreational fisheries. Catch monitoring programs should monitor changes in effort and changes in proportion of landings between the three fisheries.

APPENDIX 1: Working Paper Summary

Working Paper I2003-05: Assessment of the Dungeness Crab Population in the Nass Estuary, 2000 and 2001

R.F. Alexander, W.J. Gazey, and I. Winther

Dungeness crabs (*Cancer magister*) were captured with traps in the Nass Estuary from June 2000 to April 2002 to monitor abundance and collect biological samples. A total of 1845 traps (264 trap sets) were fished and 20,978 crabs captured. Catches of crabs included 12,164 males and 8,814 females. Of the male catch, 6343 legal- (>153 mm notch width [NW]), 5297 sub-legal- (127-153 mm NW) and 519 small- (<127 mm NW) sized crabs were caught. A total of 5976 male crabs, 2976 in 2000 and 3000 in 2001, were anchor-tagged between May and September in three defined release areas. In 2000, thirty anchor-tagged crabs were also tagged with an ultrasonic transmitter in August and tracked opportunistically by boat until November. A total of 1679 tagged crabs were later recovered during sampling sessions and in marine (Nisga'a and commercial) fisheries. Counts of marked and unmarked crabs from observed catches (sampling and commercial-fishery patrol observations) and unobserved marine catches and recoveries were used to compute a population estimate in 2000 (73,489 [CI=70,042, 76,936]) and 2001 (110,312 [CI=99,558, 121,066]) for legal-sized male Dungeness crabs. Exploitation rates of the legal-sized males in the Nass Estuary were estimated at 54% and 41% for 2000 and 2001, respectively, assuming an annual instantaneous natural mortality and tag loss rate of 1.5. Of the overall exploitation rates calculated for the Nass Estuary for 2000 and 2001, the exploitation rates for the commercial-opened area were 61% and 57%, respectively, and for the commercial-closed area 25% and 12%, respectively. A catch per effort analysis was also performed for standard trap sets conducted in the open and closed areas of the Nass Estuary to test for seasonal variations in abundance and to compare with the mark-recapture results. As a result of these analyses, the commercial fishery was found not to have a negative effect on the availability of legal-sized male crabs in the closed area. In addition, the level of harvest and effort observed in this study suggests that the legal-size male Dungeness crab population is not being over exploited in the Nass Estuary.

Mark-recovery data and size frequency analysis indicated that peak moulting is occurring in the spring and early summer months. Consequently, the 6-wk commercial fishery in the Nass Estuary between October and mid-November is being conducted during the period of highest percentage of hard-shelled males. This study also provided information on the female and sub-legal male populations, vertical and horizontal distribution of crabs within the Nass Estuary, incidence of injury and spawning marks.

APPENDIX 2: PSARC Invertebrate Subcommittee Meeting Agenda, November 21, 2003

AGENDA
PSARC INVERTEBRATE SUBCOMMITTEE MEETING
November 21, 2003
Seminar Room - Pacific Biological Station

Nanaimo, BC

Friday, November 21

8:30	Introductions and Opening Remarks.
9:00-12:00	Assessment of the Dungeness Crab Population in the Nass Estuary, 2000 and 2001 (R.F. Alexander, W. J. Gazey, and I. Winther)
12:00	Lunch
1:00-2:00	Dungeness Crab continued if required.
2:00-3:00	Formulation of Subcommittee Conclusions and Recommendations

APPENDIX 3: List of Attendees & Reviewers

Subcommittee Chair: J. Boutillier
PSARC Chair: A. Cass

DFO Participants	Fri.
* Subcommittee Members	
J. Boutillier* (Chair)	X
B. Bornhold*	X
A. Campbell*	X
D. Clark	X
B. Ennevor	X
G. Gillespie*	X
C. Hand*	X
R. Harbo*	X
R. Lauzier*	X
J. Morrison	X
R. Mylchreest*	X
G. Parker*	X
I. Perry*	X
J. Rogers*	X
I. Winther	X
Z. Zhang	X

External Participants:	Fri.
Alexander, Richard (LGL consulting)	X
Chow, S. (Sierra Club of B.C.)	X
Gazey, W. (W.J. Gazey Research)	X
Holmes, H. (Pacific Rim National Park)	X
Lemmon, K. (Rapporteur)	X
Stephens, C. (Nisga'a Lisims Government)	X
Stewart, B. (Nisga'a Lisims Government)	X

Reviewers for the PSARC papers presented at this meeting are listed below, in alphabetical order. Their assistance is invaluable in making the PSARC process work.

Hankin, D.	Humboldt State University
Zhang, Z.	Fisheries and Oceans Canada